

Clarke, Modet & C^o

COLOMBIA

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 11-011871-00002-0000

Fecha: 2011-03-24 15:07:20 Dep. 2020 DIR.NUEVASCR
 Tra. 2 PATENTES Eve: 1 REGDEPOSITO
 Act. 444 RESPUESTAREQUE Folios: 50

P-2820

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
 DIVISION DE NUEVAS CREACIONES

E. S. D.

Ref.: Expediente No. 11.011.871
 Solicitud de Patente a nombre de
KELLOGG BROWN & ROOT LLC.

Yo, DILIA MARÍA RODRÍGUEZ D'ALEMAN, identificada como aparece al pie de mi firma, domiciliada en la Carrera 11 No. 86-53, piso 6, obrando como apoderada de la sociedad **KELLOG BROWN & ROOT LLC.** domiciliada en Houston, Texas, Estados Unidos de América, solicitante de la patente de la referencia, en respuesta al oficio No. 05059 notificado por fijación en lista el día 17 de marzo de 2011, atentamente me permito presentar:

1. Copia auténtica del poder otorgado por la sociedad como también del certificado de existencia y representación legal de dicha sociedad debidamente apostillados. De los documentos mencionados se acompaña la correspondiente traducción oficial al español debidamente legalizada por el Ministerio de Relaciones Exteriores de Colombia
2. Documentos (2) en que consta la cesión del derecho a la patente otorgada por los inventores a favor de mi mandante.

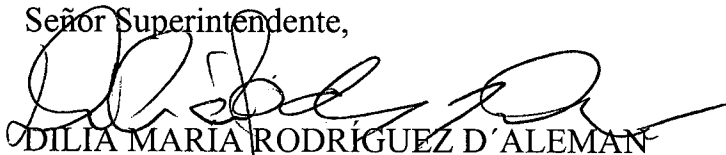
Sobre el particular es importante resaltar que, de conformidad con las normas legales vigentes, artículo 1 de la Resolución 210 de 2001, expedida por el Superintendente de Industria y Comercio y artículo 2 de la Convención de la Haya, el documento en inglés que se pretenda aportar como parte de los trámites de propiedad industrial ante la Superintendencia de Industria y Comercio no requieren traducción. Por otro lado, la legalización consular y/o diplomática de los documentos expedidos en el extranjero no es necesaria. Por lo tanto, el documento de cesión anexo a este memorial es válidamente presentado en idioma inglés y con la correspondiente apostilla.

3. Copia certificada de la solicitud de Patente número 12/699,325 del 03 de febrero de 2010, con la debida traducción de lo pertinente.

Sobre el particular es importante resaltar que, debido a un error taquigráfico involuntario de nuestro cliente al momento de presentar el formulario de la solicitud indicó que el número de prioridad era el 12/699,235 siendo el correcto el número 12/699,325

Espero con esto haber dado cabal cumplimiento a lo solicitado por ese despacho y de conformidad con lo indicado en los artículos 3º., inciso 3, 35 inciso 2 y 59 inciso 2 del CCA, al analizar este memorial, atentamente ruego se traten todas las cuestiones planteadas con motivo del mismo.

Señor Superintendente,



DILIA MARIA RODRÍGUEZ D'ALEMAN

C.C. 41.654.882 de Bogotá.

T.P. 20824 CSJ



P-28720
40

The State of Texas

Secretary of State

Not for use within the United States of America.

This Apostille only certifies the signature, the capacity of the signer and the seal or stamp it bears. It does not certify the content of the document for which it was issued.

APOSTILLE

(Convention de La Haye du 5 Octobre 1961)

1. Country: United States of America

This public document

2. has been signed by PATSI A DAVIS

3. acting in the capacity of Notary Public, State of Texas

4. and bears the seal/stamp of PATSI A DAVIS, Notary Public, State of Texas,
Commission Expires: 12-17-13

CERTIFIED

5. at Austin, Texas

6. on February 25, 2011

7. by the Secretary of State of Texas

8. Certificate No. N-787391

9. Seal

10. Signature:



A handwritten signature in cursive script, reading "Hope Andrade".

Hope Andrade
Secretary of State
ST/EG



COLOMBIA

Carrera 11 N° 86-53 Piso 6 Bogotá Colombia Tel: (57 1) 6181088 Fax: (57 1) 6350824 Email: info@clarkemodet.com.co

PODER

Yo (nosotros), abajo firmante(s)

en mi (nuestro) carácter de representante(s) legales de **KELLOGG BROWN & ROOT LLC**

una sociedad organizada y existente de acuerdo con las leyes de

y en actual cumplimiento de su objeto social, con domicilio en **601 Jefferson Avenue, Houston, Texas 77002, Estados Unidos de América.**

por el presente instrumento confiero (conferimos) poder especial a favor de **DILIA MARIA RODRIGUEZ D'ALEMAN**, con Cédula de Ciudadanía No. 41.654.882 de Bogotá, y tp. 147.463 y **SILVANA MARIA LOPEZ DIAZ**, con Cédula de Ciudadanía No. 22.468.787 de Barranquilla, y tp. 147.463, con domicilio en Bogotá, Colombia, para que actuando en su orden en nombre del (de la) otorgante le (la) representen ante cualquier entidad, autoridad y/o persona, especialmente ante las del orden Administrativo, Contencioso Administrativo, Judicial, Tribunales de Arbitramento y/o cualquier otro en lo referente a los siguientes asuntos:

- 1) Solicitar, tramitar, obtener y/o registrar cualquiera de las modalidades de Propiedad Industrial, tales como: patentes de invención, modelos de utilidad; diseños industriales, variedades vegetales; marcas, lemas, nombres y enseñanzas comerciales y denominaciones de origen; así como sus renovaciones, prórrogas, transferencias, cambios de nombre y/o domicilio, contratos y licencias.
- 2) Solicitar, tramitar, obtener y/o registrar derechos de autor, en cualquiera de sus presentaciones así como la protección de secretos industriales y know-how.
- 3) Solicitar, tramitar, obtener y/o registrar registros sanitarios, permisos y/o licencias de funcionamiento; así como sus renovaciones o prórrogas, transferencias, cambios de nombre y/o domicilio, contratos y licencias.
- 4) Ejercer acciones de oposición, observación, reclamos, reconsideración, reposición, apelación, cancelación administrativa o judicial, nulidad, protección al consumidor, concesión de licencias, protección de secretos industriales y demás acciones y recursos relacionados con derechos derivados de los asuntos arriba indicados y en contra de la competencia desleal, acciones derivadas de la obtención o explotación de licencias, acciones de indemnización de perjuicios. También podrá(n) intervenir en juicios civiles, comerciales, penales, contencioso-administrativos, tutelas y de policía; en acciones o juicios promovidos por el (la) mandante o en contra el (ella).
- 5) Registrar nombres de dominio ante la entidad competente.
- 6) En el ejercicio de este mandato los mandatarios arriba mencionados quedan facultados para: conciliar, cancelar, transigir, comprometer en árbitros, desistir, recibir y tomar posesión de la cosa objeto de litigio y renunciar o desistir a derechos concedidos o en curso de concesión, admitir los hechos del proceso.
- 7) Ratificar o no la agencia oficiosa.
- 8) Así mismo faculto (facultamos) a los mencionados apoderados para recibir notificaciones y designar apoderados judiciales o extrajudiciales, sustituir el presente poder y revocar las sustituciones que hicieren.

Dado y firmado en

a los días de

POWER OF ATTORNEY

I (we), the undersigned **Christian Heausler**

legal representative(s) of **KELLOGG BROWN & ROOT LLC**

an organization existing under the laws of **the State of Delaware**

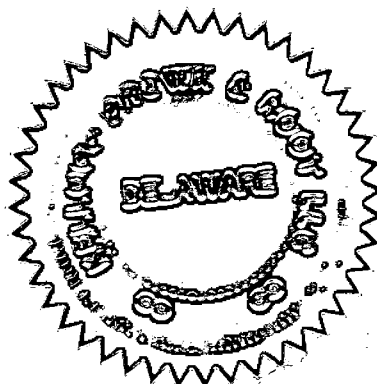
and in present execution of its business activity, domiciled **601 Jefferson Avenue, Houston, Texas 77002, United States of America.**

do hereby grant POWER OF ATTORNEY to **DILIA MARIA RODRIGUEZ D'ALEMAN**, identification card No. 41.654.882 of Bogotá, and tp. 20824 and **SILVANA MARIA LOPEZ DIAZ**, identification card No. 22.468.787 of Barranquilla, and tp 147.463 residing in Bogotá, Colombia, to act in the order of their appointment in behalf of grantor before any entity, authority and/or natural or juridical person, specially before those Administrative, Administrative-Contentious, Judicial, arbitration courts, and/or any other, in all matters concerning the following:

- 1) To apply, process, obtain and/or register any of the modalities of Industrial Property, such as: Patents of Invention, Utility Models; Designs, plant varieties; Marks, Slogans, Trade Names and emblems and appellations of Origin; as well as their renewals, assignments, changes of name and/or domicile, agreements and licenses.
- 2) To apply, process, obtain and/or register copyrights of any kind as well as protection of industrial secrets or know-how.
- 3) To apply, process, obtain and/or register sanitary registrations, operating authorizations and/or licenses; as well as their renewals or assignments, changes of name and/or domicile, agreements and licenses.
- 4) To bring actions of opposition, observations, claims, reconsideration, appeal or legal remedies, cancellations, nullity, protection to the consumer, granting of licenses, protection of trade secrets and other actions related with rights derived from the above-mentioned matters and against the unfair competition, actions resulting from the obtaining or exploitation of licenses, recovering damages actions. They can also intervene or participate in Civil, Commercial, Criminal or Contentious-Administrative Trials; the actions for writ mandamus, police actions; in actions, lawsuits or litigations instituted by the grantor or against him.
- 5) To register domain names before the competent entity.
- 6) To the effect of this mandate the above-named proxy are empowered to: conciliate, cancel, settle, submit to arbitration, withdraw and to receive and take possession of the litigation related objet and waive or renounce the rights granted or in process of granting, admit the facts of the case.
- 7) To ratify or not the officious agency.
- 8) I (we) hereby appoint the afore mentioned attorneys with powers to receive notifications and to designate judicial and extrajudicial attorneys, substitute this Power of Attorney and to revoke such substitutions.

Granted and signed at

on this **21st** day of **February** of **2011**



CERTIFICADO NOTARIAL

(Cuando el solicitante es SOCIEDAD)

(Poderes otorgados en: El Salvador, Estados Unidos, México y Venezuela)

A los _____ días del mes de _____ de _____
el Notario que suscribe DA FE de que:

1. _____
(nombre de la persona que firma el poder)

mayor de edad y domiciliado en _____
firmó de su puño
y letra el documento que antecede.

2. Conoce al (a la) otorgante y que este (a) está legalmente capacitado para el otorgamiento.

3. El otorgante ha firmado el referido documento en su carácter de _____
de la persona jurídica **KELLOGG BROWN & ROOT LLC**

4. La citada persona jurídica con sede en **601 Jefferson Avenue, Houston, Texas 77002, Estados Unidos de América.** está legalmente constituida, que tiene actualmente existencia legal y que el acto para el cual se ha otorgado este poder está comprendido entre los que constituyen su objeto social.

5. El otorgante tiene efectivamente la representación que ostenta, que esta es legítima y que está facultado para otorgar este poder.

6. Las anteriores certificaciones de los puntos 3, 4 y 5, me constan porque he tenido a la vista los documentos auténticos.

Notario Público

NOTA: A continuación de lo anterior, el Cónsul de Colombia debe autenticar la firma del Notario Público.

CERTIFICADO NOTARIAL (Cuando el solicitante es INDIVIDUO)

A los _____ días del mes de _____ de _____
el Notario que suscribe DA FE de que:

1. _____
(nombre de la persona que firma el poder)

mayor de edad y domiciliado en _____
firmó en su presencia
el documento que antecede, conoce al otorgante y que este está legalmente capacitado para el otorgamiento.

Notario Público

NOTA: A continuación de lo anterior, el Cónsul de Colombia debe autenticar la firma del Notario Público.

Para todos los demás países el Señor Cónsul de Colombia o ante quien se otorgue, debe expedir una certificación dejando constancia 1) de la existencia legal de la sociedad, 2) de que esta ejerce actualmente su objeto social, y 3) de que la persona o personas que otorgan el poder están facultadas para hacerlo, dejando constancia así mismo de que tuvo a la vista las pruebas que acrediten tales circunstancias.

**LEGALIZACIÓN POR EL CONSUL DE COLOMBIA
O POR APOSTILLA**

NOTARIAL CERTIFICATE

(When the applicant is a CORPORATION)

(Powers of attorney granted in: El Salvador, Mexico, U.S.A. and Venezuela)

This **21st** day of **February, 2011**
the undersigned Notary CERTIFIES that:

1. **Christian Heausler**
(name of the person who signs the power of attorney)

of _____ legal _____ age _____ and _____ domiciled
in **Houston, Texas, USA** set his hand on
the foregoing document.

2. The grantor is to him personally known and that he/she has legal capacity to execute the document.

3. The grantor has executed the foregoing document in his capacity of **Chief IP Counsel**
of the juridical **KELLOGG BROWN & ROOT LLC**

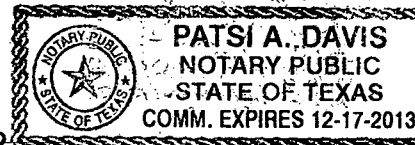
Christian Heausler

4. The mentioned juridical person with place of **601 Jefferson Avenue, Houston, Texas 77002, United States of America.** is duly organized, has actual legal existence and that the purposes for which the power of attorney is granted are within the scope of its corporate purposes.

5. The grantor has in fact the referred quality and that his/her representation is legal and that he/she is empowered to grant this power of attorney.

6. I have based the above certifications 3, 4 and 5, on the authentic documents which for such purpose were exhibited to me.

Patsi A. Davis
Notary Public



NOTA: Then the Colombian Consul must legalize the signature of the Notary Public.

NOTARIAL CERTIFICATE (When the applicant is an INDIVIDUALS)

On this _____ day of _____
the undersigned Notary CERTIFIES that:

1. _____
(name of the person who signs the Power of Attorney)

of legal age and domiciled at _____
signed in his presence the foregoing
document, the grantor is to him personally known and that he/she has legal capacity to execute the document.

Notary Public

NOTA: Then the Colombian Consul must legalize the signature of the Notary Public.

For all other countries the Colombian Consul or before who it is granted must issue a certification stating 1) the legal existence of the corporation, 2) that the corporate purposes are actually being accomplished, 3) that the person or persons who grant this Power of Attorney are empowered to do it. The Consul will certify also that the documents evidencing those circumstances were exhibited to him.

**LEGALIZATION BY THE COLOMBIAN CONSUL OR BY
APOSTILLE.**

Traducción oficial hecha por Jimena Escobar Uribe, traductora e intérprete oficial según resolución No. 0369 de 1995 del Ministerio de Justicia, del documento legalizado mediante la **APOSTILLA** No. **N-787381** de 25 de febrero de 2011 expedida en Estados Unidos de América (Texas) correspondiente a un documento de poder de **KELLOGG BROWN & ROOT LLC**, domiciliada en Houston, Texas, Estados Unidos de América y certificado notarial sobre existencia y representación legal de la misma sociedad.

Poder

Yo, el suscrito Christian Heausler, representante legal de KELLOGG BROWN & ROOT LLC, una sociedad existente bajo las leyes de Estado de Delaware y que actualmente ejerce su actividad corporativa, domiciliada en 601 Jefferson Avenue, Houston, Texas 77002, Estados Unidos de América

(Nota del traductor: El resto del documento se encuentra con idéntico texto en la parte izquierda del documento en idioma español, razón por la cual no se hace su traducción).

Firmado por firma ilegible el 21 de febrero de 2011. Sello de Kellogg Brown & Root LLC, Delaware.

Certificado notarial

Certificado notarial:

Este día 21 de febrero de 2011, el suscrito notario CERTIFICA que:

1. Christian Heausler, mayor de edad y domiciliado en Houston, Texas, Estados Unidos de América firmó el documento anterior.

2. El otorgante es conocido personalmente por él y él/ella tiene capacidad legal para ejecutar el documento.

3. El otorgante ha ejecutado el documento anterior en su capacidad de Abogado Principal de Propiedad Intelectual de la persona jurídica KELLOGG BROWN & ROOT LLC.

4. La mencionada persona jurídica con sede en 601 Jefferson Avenue, Houston, Texas 77002, Estados Unidos de América está debidamente constituida, tiene existencia legal vigente y los propósitos para los cuales se otorga el poder de abogado están dentro del ámbito de sus objetivos corporativos.

(Nota del traductor: El resto del documento se encuentra con idéntico texto en la parte izquierda del documento en idioma español, razón por la cual no se hace su traducción).

Sello notarial: Patsi A. Davis, notario público, Estado de Texas, mi comisión termina el 17 de diciembre de 2013.

Sello del Estado de Texas

Estado de Texas

Secretario de Estado

No para uso en los Estados unidos de América.

Esta Apostilla únicamente certifica la firma, la capacidad del firmante y el sello o estampilla que lleva. No certifica el contenido del documento para la cual fue expedida.

APOSTILLA

(Convención de la Haya de 5 de octubre de 1961)

1. País: Estados Unidos de América

Este documento público

2. ha sido firmado por Patsi A. Davis

3. actuando en su calidad de Notario Público, Estado de Texas

4. lleva el sello/estampilla de Patsi A. Davis, notario público, Estado de Texas, comisión termina: 12-17-13

CERTIFICADO

5. En Austin, Texas

6. El 25 de febrero de 2011

7. Por el Secretario de Estado de Texas

8. Certificado No. N-787391 /

9. Sello/Estampilla: Sello del Estado de Texas

10. Firma: Firmado por Hope Andrade, Secretario de Estado

SECRETARIO DE ESTADO
HOPE ANDRADE

APOSTILLE

(Convention de La Haye du 5 octobre 1961)

1. Country: United States of America

This public document

2. has been signed by T. Wallace

3. acting in the capacity of Certifying Officer

4. bears the seal/stamp of U.S. Patent and Trademark Office

Certified

5. at Washington, D.C.

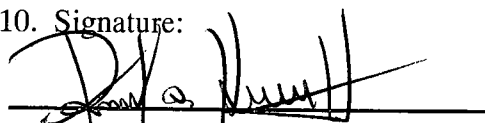
6. the twenty-eighth of February, 2011

7. by Assistant Authentication Officer, United States Department of State

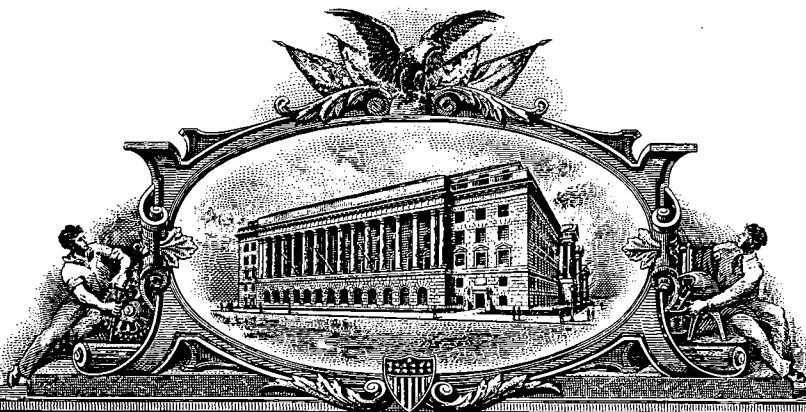
8. No. 11018883-8

9. Seal/Stamp:

10. Signature:


Patrick O. Hatchett

A 7278931



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

February 01, 2011

THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE
RECORDS OF THIS OFFICE OF A DOCUMENT RECORDED ON
FEBRUARY 03, 2010.

By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office



T. Wallace
T. WALLACE

Certifying Officer

PATENT ASSIGNMENT

Electronic Version v1.1
Stylesheet Version v1.1

SUBMISSION TYPE:	NEW ASSIGNMENT								
NATURE OF CONVEYANCE:	ASSIGNMENT								
CONVEYING PARTY DATA									
<table border="1"><thead><tr><th>Name</th><th>Execution Date</th></tr></thead><tbody><tr><td>Anand Subramanian</td><td>01/20/2010</td></tr><tr><td>Raymond H. Floyd</td><td>01/20/2010</td></tr><tr><td>Vasant K. Patel</td><td>01/20/2010</td></tr></tbody></table>	Name	Execution Date	Anand Subramanian	01/20/2010	Raymond H. Floyd	01/20/2010	Vasant K. Patel	01/20/2010	
Name	Execution Date								
Anand Subramanian	01/20/2010								
Raymond H. Floyd	01/20/2010								
Vasant K. Patel	01/20/2010								
RECEIVING PARTY DATA									
Name:	Kellogg Brown & Root LLC								
Street Address:	601 Jefferson Avenue								
City:	Houston								
State/Country:	TEXAS								
Postal Code:	77002								
PROPERTY NUMBERS Total: 1									
<table border="1"><thead><tr><th>Property Type</th><th>Number</th></tr></thead><tbody><tr><td>Application Number:</td><td>12699325</td></tr></tbody></table>	Property Type	Number	Application Number:	12699325					
Property Type	Number								
Application Number:	12699325								
CORRESPONDENCE DATA									
Fax Number:	(713)753-7626								
<i>Correspondence will be sent via US Mail when the fax attempt is unsuccessful.</i>									
Phone:	713-753-8661								
Email:	christian.heausler@kbr.com								
Correspondent Name:	Kellogg Brown & Root LLC								
Address Line 1:	4100 Clinton Drive								
Address Line 2:	01-676								
Address Line 4:	Houston, TEXAS 77020								
ATTORNEY DOCKET NUMBER:	09-10								
NAME OF SUBMITTER:	Christian Heausler								
Total Attachments: 2 source=0910_Executed_Assignment#page1.tif									

CH \$40.00 12699325

501084064

PATENT
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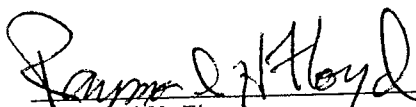
PATENT
DKT NO. 09-10US

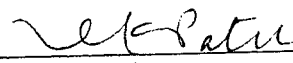
ASSIGNMENT

IN CONSIDERATION of Ten Dollars and other good and valuable consideration, the receipt of which is hereby acknowledged, I/We, ANAND SUBRAMANIAN of 6, Canaveral Creek Lane, Sugar Land TX 77479, U.S.A; Raymond H. Floyd, of 2210 Lytham Lane, Katy, TX 77450, U.S.A.; and Vasant K. Patel, of 4102 Tremont Ct., Sugar Land, TX 77479, U.S.A; do hereby sell, assign and transfer to KELLOGG BROWN & ROOT LLC, a limited liability company of the State of Delaware, having a place of business at 601 Jefferson Avenue, Houston, Texas 77002, its successors and assigns, the entire right, title and interest in and to the invention entitled "SYSTEMS AND METHODS OF PELLETIZING HEAVY HYDROCARBONS" (Dkt. No. 09-10/108), invented by me, and the application for United States Patent therefore, executed concurrently herewith, and all provisional applications, patents granted therefore in the United States and all foreign countries, and all divisions, reissues, continuations and extensions thereof, and I hereby covenant that I have full right so to do, and I hereby authorize and request the Commissioner of Patents to issue all patents on said invention or resulting therefrom to said Company as assignee of the entire, right, title, and interest therein, and I agree that I will sign all lawful papers, execute all divisional, continuation and reissue applications, make all rightful oaths and generally do everything possible to aid said Company, its successors, assigns and nominees, to obtain and enforce proper patent protection for said improvements in the United States and all foreign countries.

EXECUTED THIS 20 day of Jan, 2010.


Anand Subramanian


Raymond H. Floyd


Vasant K. Patel

PATENT
REEL: 023891 FRAME: 0675

PATENT
DKT NO. 09-10US

STATE OF Texas
COUNTY OF Harris

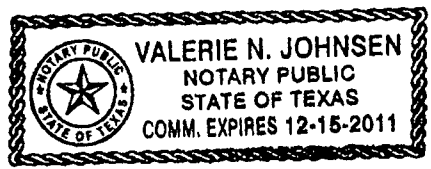
§
§
§

On this day, before me personally appeared the above named Anand Subramanian, Raymond H. Floyd, and Vasant K. Patel to me personally known as the individual who executed the foregoing assignment, who acknowledged to me that he executed the same of his own free will for the purposes therein set forth.

GIVEN UNDER MY HAND and seal of office this 20 day of January, 2010.

Valerie N. Johnsen
NOTARY PUBLIC

[SEAL]



RECORDED: 02/03/2010

PATENT
REEL: 023891 FRAME: 0676

ESTADOS UNIDOS DE AMERICA
A TODOS AQUELLOS A QUIENES EL PRESENTE LLEGUE:

DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS
Oficina de Patentes y Marcas de los Estados Unidos

Febrero 10, 2011

La presente es para certificar que el anexo es una copia fiel de los registros de la Oficina de Patentes y Marcas de los Estados Unidos, de los documentos de la solicitud de patente identificada más adelante, que cumplieron con los requerimientos para concederse una fecha de presentación de acuerdo con 35 USC 111.

Número de Solicitud: 12/699,325

Fecha de Presentación: Febrero 3, 2010

EL CÓDIGO DEL PAÍS Y EL NÚMERO DE SU SOLICITUD DE PRIORIDAD, PARA SER USADA EN LA PRESENTACIÓN EXTRANJERA BAJO EL CONVENIO DE PARÍS ES US12/699,325

Por la autoridad de

Bajo el Secretario de Comercio para la Propiedad Intelectual y el Director de la Oficina de Patentes y Marcas de los Estados Unidos de América

(fdo) **M.K. CARTER**

Oficial Certificador

Sello oficial de la Oficina de Patentes y Marcas de los Estados Unidos de América

PA 1830429

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

February 10, 2011

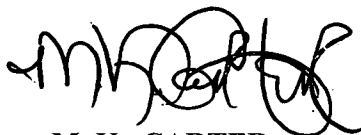
THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM
THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK
OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT
APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A
FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: 12/699,325

FILING DATE: February 03, 2010

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY
APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS
CONVENTION, IS US12/699,325

By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office



M. K. CARTER
Certifying Officer



Electronic Acknowledgement Receipt

	EFS ID:	6940366
	Application Number:	12699325
	International Application Number:	
	Confirmation Number:	5717
	Title of Invention:	System and Methods of Pelletizing Heavy Hydrocarbons
	First Named Inventor/Applicant Name:	Anand Subramanian
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Drawings-only black and white line drawings	0910_FINAL_FIGS_02032010.pdf	52312 24b6e3b6fdd05577c80f6710c4c93a20d21b4a8	no	4
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2	Oath or Declaration filed	0910_Executed_Decl_POA.pdf	74806 dc299e668458b4602fc73e4b33c6c58276a5230d	no	2
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3	Information Disclosure Statement (IDS) Filed (SB/08)	0910_PTO_SB_08a.pdf	613760 618201a5c94bae189ad09a41225b3bad8f5c0fcb	no	10
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4	Foreign Reference	CA2069515.pdf	591629 1aa32b69c1474dd95d48b554484bd0ef5e36c189	no	24
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5		0910_Final_Application_02032010.pdf	671299 f977476721cd0e6896f81c748671ddcabb994a45	yes	16
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	Document Description		Start	End	
	Specification		1	12	
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6	Application Data Sheet	0910_Application_Data_Sheet.pdf	839421 e22cf09bb7e8942d59af5e5d8c36f83e642a95f8	no	5
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7	Fee Worksheet (PTO-875)	fee-info.pdf	32675 c56438a2da40bcac77ce5ddceddc76e630f1cab9	no	2

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UNITED STATES PATENT APPLICATION FOR:
SYSTEM AND METHODS OF PELLETIZING HEAVY HYDROCARBONS

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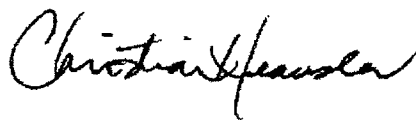
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SYSTEM AND METHODS OF PELLETIZING HEAVY HYDROCARBONS

BACKGROUND OF THE INVENTION

Field of the Invention

[001] Embodiments provided herein generally relate to systems and methods for cooling and solidifying asphaltenes. More particularly, embodiments provided herein relate to the extrusion and quenching of molten hydrocarbons.

Description of the Related Art

[002] Heavy hydrocarbons, such as high molecular weight, viscous, non-Newtonian fluids are produced during extraction and refining processes. Such heavy hydrocarbons typically require dilution prior to transport. Often, one or more lighter hydrocarbons such as diesel fuel are added to reduce the viscosity and improve the pumpability and facilitate the transport of heavy hydrocarbons. Alternatively, heavy hydrocarbons can be deasphalted using one or more solvent deasphalting processes, such as the Residuum Oil Supercritical Extraction ("ROSE") treatment process. During a typical solvent deasphalting process, the heavy hydrocarbons are introduced to a solvent extraction process wherein high viscosity asphaltenes and resins ("asphaltenic hydrocarbons") are separated and removed, providing a low viscosity deasphalted oil. Similar asphaltenic hydrocarbons can be generated during other heavy hydrocarbon refining processes. While generated using two different processes, *i.e.*, solvent extraction and/or refining, the asphaltenic hydrocarbons share similar characteristics. Both are rich in heavy molecular weight hydrocarbons, which at ambient temperatures are solid or semi-solid, both require elevated temperatures to maintain pumpability, and both require dilution to provide one or more fungible products.

[003] Where local upgrading facilities are unavailable or capacity-limited, the asphaltenic hydrocarbons must be transported via truck, rail, or pipeline to one or more remote upgrading facilities. Asphaltenic hydrocarbons are often maintained at elevated temperatures to permit pumpable loading and unloading of the liquid or semi-solid asphaltenic hydrocarbons to/from truck, rail, and/or pipeline. The need to maintain the asphaltenic hydrocarbons at elevated temperatures throughout transport increases operation costs, complicates the process, and risks solidification of the asphaltenic hydrocarbons should the temperature decrease. Solidified asphaltenic hydrocarbons have a tendency to

plug pipelines which can require extensive maintenance and/or cleaning of the pipelines and any transport vehicles, such as trucks and rail wagons.

[004] As an alternative to fluid or semi-solid transport, the asphaltenic hydrocarbons can be cooled in bulk and solidified prior to transport. However, bulk solidification, loading, transport, and unloading of bulk solidified materials can be cost, labor, and maintenance intensive. To minimize special equipment and/or handling requirements, the asphaltenic hydrocarbons can alternatively be solidified into smaller particulates or pellets prior to transport.

[005] Various methods for pelletizing heavy hydrocarbons have been developed. For example, a molten heavy hydrocarbon can be pumped out a nozzle and formed into a series of droplets upon falling into a bath of cooling media flowing beneath the hydrocarbon distributor. Alternatively, one or more wetted pelletizers can be used to provide relatively uniform heavy hydrocarbon solids by "spraying" a molten asphaltenic hydrocarbon through a rotary head to form a plurality of hydrocarbon droplets. The individual hydrocarbon droplets are air-cooled while in flight, thereby solidifying into hydrocarbon pellets as they impact and flow down the walls of the wetted pelletizer into an underlying cooling fluid bath.

[006] The usefulness of the cooling bath or the wetted pelletizer is limited, however, based upon the variable specific gravity of the hydrocarbon pellets, which can range from less than water (*i.e.*, a specific gravity of less than 1.0 or an API density of greater than 10°) to greater than water (*i.e.*, a specific gravity of greater than 1.0 or an API density of less than 10°). The formation of both floating and sinking hydrocarbon pellets within the cooling fluid cooling channel makes the separation and removal of the pellets difficult since the floating pellets tend to agglomerate forming large masses, which are not amenable to removal from the cooling fluid cooling channel particularly where the cooling channel is located within an enclosed vessel.

[007] Therefore, there exists a continuing need for improved systems and methods for pelletizing heavy hydrocarbons.

BRIEF DESCRIPTION OF THE DRAWINGS

[008] So that the recited features of the present invention can be understood in detail, a more particular description of the invention may be had by reference to embodiments, some of which are illustrated in the appended drawings. It is to be noted, however, that the appended drawings illustrate only typical embodiments of this invention and are therefore not to be considered limiting of its scope, for the invention may admit to other equally effective embodiments.

[009] Figure 1 depicts a side view of an illustrative system for pelletizing heavy hydrocarbons, according to one or more embodiments of the present disclosure.

[0010] Figure 2 depicts a front view of the illustrative system for pelletizing heavy hydrocarbons as shown in Figure 1.

[0011] Figure 3 depicts an illustrative system for pelletizing heavy hydrocarbons, according to another embodiment of the present disclosure.

[0012] Figure 4 depicts an illustrative system for pelletizing heavy hydrocarbons, according to another embodiment of the present disclosure.

DETAILED DESCRIPTION

[0013] A detailed description will now be provided. Each of the appended claims defines a separate invention, which for infringement purposes is recognized as including equivalents to the various elements or limitations specified in the claims. Depending on the context, all references below to the "invention" may in some cases refer to certain specific embodiments only. In other cases it will be recognized that references to the "invention" will refer to subject matter recited in one or more, but not necessarily all, of the claims. Each of the inventions will now be described in greater detail below, including specific embodiments, versions and examples, but the inventions are not limited to these embodiments, versions or examples, which are included to enable a person having ordinary skill in the art to make and use the inventions, when the information in this patent is combined with publicly available information and technology.

[0014] Systems and methods for pelletizing heavy hydrocarbons, such as asphaltenes, are provided. In at least one embodiment, hot asphaltenes can be extruded through a drop

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former and deposited onto a conveyor belt there below to form droplets. The droplet can be subsequently quenched in a cooling media to solidify the droplets into asphaltenic pellets. In one or more embodiments, the asphaltenic pellets can be separated from the cooling media and recovered as cooled, solid particles for transport or use.

[0015] As used herein, the terms "asphaltene," "asphaltenes," "asphaltenic," and "asphaltenic hydrocarbons," can be used interchangeably and refer to a hydrocarbon mixture containing one or more heavy hydrocarbons that are insoluble in light, paraffinic, solvents, such as pentane and heptane, but are soluble in aromatic compounds such as toluene. The heavy hydrocarbons can include one or more aromatic and/or naphthenic compounds containing an average of about 50 to about 80 carbon, nitrogen, sulfur, and oxygen atoms.

[0016] As used herein, the terms "solid asphaltenic particles," "solid asphaltene particles", and "solid particles" can refer to any of the following: solid asphaltene particles, semi-solid asphaltene particles, and composite asphaltene particles having a solid asphaltene 'skin' surrounding a molten asphaltene 'core.'

[0017] Figure 1 depicts an end view of an illustrative asphaltene pelletization system 100, according to at least one embodiment of the disclosure. The system 100 can include a drop former 102 having a stator 104 and a rotary outer drum 106. The stator 104 can be nested within the rotary outer drum 106, while the rotary outer drum 106 can be configured to concentrically-rotate with respect to the stator 104. The stator 104 can include an axially-disposed feed channel 108 configured to receive a low-viscosity flowable mass from a vessel or supply pipe (not shown). In at least one embodiment, the flowable mass can include a hot heavy hydrocarbon that is a solid at ambient temperatures. For example, the heavy hydrocarbon can include an asphaltene, but can also include any hot liquid that is a solid at near ambient, or room temperatures, such as residues from various refining processes. In an embodiment, the flowable mass can be pumped under pressure into the feed channel 108 from one end of the stator 104, and eventually extruded for pelletization, as described below.

[0018] The temperature of the heavy hydrocarbon, or asphaltenes, introduced into the feed channel 108 can range from about 210°C to about 430°C, from about 210°C to about 370°C, or from about 210°C to about 315°C. The pressure of the molten asphaltenes can vary greatly and may depend on the upstream processing requirements. In at least one embodiment, the pressure can be about atmospheric pressure, and can range from about 101

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kPa to about 2,160 kPa, about 300 kPa to about 1,820 kPa, or from about 500 kPa to about 1,475 kPa.

[0019] In at least one embodiment, the stator 104 can also include at least one heater module 110 (two heaters 110 are shown) configured to maintain the molten asphaltenes an elevated temperature while inside the stator 104. In operation, the heater module 110 can have a heated medium continuously routed through it, thereby serving as a heat exchanger. The heater module 110 can also include a heater coil or similar heating device similarly configured to maintain an elevated temperature of the molten asphaltenes.

[0020] A bore 112, or series of bores, can be communicably coupled to the feed channel 108 and extend to a duct 114 configured to feed the molten asphaltenes into a nozzle 116 that is mounted to the stator 104. The nozzle 116 can include a downwardly-open channel 118 configured to coincide cyclically with a plurality of perforations 120 defined around the periphery of the rotary outer drum 106. As is more aptly shown in Figure 2, there can be several perforations 102 defining several rows around the periphery of the rotary outer drum 106.

[0021] Still referring to Figure 1, the molten asphaltenes can be pumped under pressure to the feed channel 108 of the drop former 102. The molten asphaltenes may then flow through the stator 104 to the nozzle 116 where it is directed to the downwardly-open channel 118. A system for baffles and internal nozzles (not shown) built into the stator 104 can impart a uniform pressure across the whole width of the channel 118, thereby providing an even flow through each row of perforations 120 defined in the rotary outer drum 106 as it rotates in the direction of arrow A. As the rotary outer drum 106 turns concentrically around the stator 104, droplets 122 of molten asphaltenes can be extruded from the drop former 102 and deposited on a variety of transfer surfaces below.

[0022] In at least one embodiment, a suitable transfer surface can include a conveyor belt 124 located directly beneath the drop former 102. The drop former 102 can be configured to deposit droplets 122 across the operating width of the conveyor belt 124 (as also illustrated in Figure 2). The conveyor belt 124 can be rotated in direction B by a pair of rollers 126 at each end. In at least one embodiment, the conveyor belt 124 can be fabricated from any metal and/or metal alloy, including, but not limited to, steel, aluminum, stainless steel, brass, bronze or any other metal and/or metal alloy resistant to potential corrosive effects of the cooling media and hydrocarbons. Although not necessary, in at least one embodiment, the

circumferential speed of the rotary outer drum 106 can be synchronized with the speed of the conveyor belt 124 below, thereby ensuring that the droplets 122 are deposited in a uniform size from one edge of the belt 124 to the other.

[0023] As illustrated, the conveyor belt 124 can be declined slightly, relative to horizontal. In other embodiments, the conveyor belt 124 can be parallel to the ground to suit other applications. As the conveyor belt 124 rotates in direction B, the droplets 122 can eventually fall off the conveyor belt 124 and drop into a cooling channel 130 containing a cooling media 132. While traveling on and falling from the conveyor belt 124, the droplets 122 can begin to externally cool, forming an external "skin." Upon contacting the cooling media 132, the droplets 122 will rapidly quench and solidify into asphaltenic pellets 134 that can be separated and collected, as described below.

[0024] In an embodiment, the cooling media 132 can include water, brine, one or more C_5 to C_9 paraffins, or mixtures thereof. The temperature of the cooling media 132 can range from about 0°C to about 100°C , from about 0°C to about 75°C , or from about 0°C to about 50°C , depending on the heat requirements of the system.

[0025] Figure 2 depicts a front view of the illustrative system for pelletizing heavy hydrocarbons as shown in Figure 1. As shown, a cooling channel 130 can be disposed at a decline with respect to horizontal, thereby allowing the cooling media 132 to continuously flow "downhill" in direction C within the cooling channel 130. As such, the flow regime of the cooling media 132 can be laminar, transitional, or turbulent, *i.e.* having any Reynolds number. In one or more embodiments, the cooling media 132 flowing through the cooling channel 130 can be in a laminar flow regime, having a Reynolds number of less than 2,000. In one or more embodiments, the cooling media 132 can be in a turbulent flow regime, having a Reynolds number greater than 4,000. In one or more embodiments, the velocity of the cooling media 132 through the cooling channel 130 can range from about 0.1 m/sec to about 10 m/sec, from about 0.2 m/sec to about 7 m/sec, or from about 0.3 m/sec to about 5 m/sec.

[0026] In an embodiment, the depth of the cooling media 132 flowing in the cooling channel 130 can range from about $\frac{1}{4}$ inch to about 2 inches, or from about $\frac{1}{4}$ inch to about 1 inch, or from about $\frac{1}{4}$ inch to about $\frac{1}{2}$ inch. In other embodiments, the depth of the cooling media 132 can include at least a depth sufficient to submerge the droplets 122. As can be appreciated, other embodiments can include adjusting the angle of decline of the cooling

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channel 130 to increase or decrease the amount of time the cooling media 132 flows within the cooling channel 130. In at least one embodiment, the cooling channel 130 can be disposed substantially horizontal, or even at an incline, and rely solely on an inlet pressure of the cooling media 132 to force/flow the asphaltenic pellets 134 in direction C.

[0027] In operation, the drop former 102 extrudes the molten asphaltenes from the plurality of perforations 120 to form droplets 122 that are dropped onto the continuously-moving conveyor belt 124 located there below, as described above. The droplets 122 can then fall off the conveyor belt 124 and into the cooling media 132 of the cooling channel 130 where they are quenched into solid asphaltenic pellets 134. Since the cooling media 132 flows in direction C, the resulting current can have the effect of forcing, or coursing, the quenched asphaltenic pellets 134 also in direction C toward a separator 202.

[0028] Although not illustrated herein, the disclosure also contemplates that include extruding the molten asphaltenes into droplets 122 that are dropped into a cooling channel 130 having a continuously-rotating conveyor (not illustrated) completely submerged in the cooling media 132. The submerged conveyor can be disposed at any angle that allows the transport of the quenched asphaltenic pellets 134 in direction C toward an adjacent separator 202.

[0029] The separator 202 can include any system, device, or combination of systems and/or devices suitable for conveying or separating at least a portion of the solid asphaltenic pellets 134 from the cooling media 132. The separator 202 can include an inclined conveyor belt 204 that continuously rotates in direction D. The conveyor belt 204, however, can be configured to allow the flow-through passage of cooling media 132, while prohibiting the passage of any asphaltenic pellets 134. For example, the conveyor belt 204 can include a screen having perforations large enough to allow the influx and passage of cooling media 132, but small enough to prevent the passage of asphaltenic pellets 134. As a result, the cooling media 132 can flow out of the cooling channel 130, through the conveyor belt 204, and into a reservoir 206, while the asphaltenic pellets 134 can be separated from the cooling channel 130 via the separator 202 in direction E. In one or more embodiments, the solid asphaltenic pellets 134 can be transported on the separator 202 to be collected or removed via mechanical transfer, e.g. shovels, bucket lift, or additional conveyors.

[0030] Many alterations and embodiments of the separator 202 are contemplated without departing from the spirit of the present disclosure. For example, the separator 202 need not

be disposed at an incline relative to horizontal, but can be horizontally disposed or even at a decline. Moreover, the separator 202 can include a moving or vibrating screen (not shown), configured to sift and separate the asphaltenic pellets 134 from the cooling media 132. In at least one embodiment, the moving or vibrating screen can be disposed at a decline relative to horizontal to allow the separated asphaltenic pellets 134 to continuously move away from the cooling channel 130. In one or more embodiments, the separator 202 can include, but is not limited to, one or more strainers, basket filters, dewatering conveyors, recessed chamber filter presses, vibrating screens, oscillating screens, or any combination thereof, arranged in series and/or parallel.

[0031] The cooling rate of the solid asphaltenic pellets 134 can be controlled by adjusting the temperature of the cooling media 134. In one or more embodiments, the cooling rate of the solid asphaltenic pellets 134 can range from about 1°C/sec to about 100°C/sec, from about 1°C/sec to about 75°C/sec, or from about 1°C/sec to about 50°C/sec. In one or more embodiments, the residence time of the solid asphaltenic pellets 134 in contact with the cooling media 132 can range from about 2 seconds to about 180 seconds, from about 3 seconds to about 120 seconds, from about 4 seconds to about 60 seconds, or from about 5 seconds to about 30 seconds.

[0032] Still referring to Figure 2, the cooling media 132 can be recycled via line 210 for subsequent reintroduction into the cooling channel 130. At least a portion of the cooling media 132 within the reservoir 206, however, can be removed and treated for discharge and/or disposal via line 208. To compensate for the loss of cooling media 132 via line 208, additional "make-up" media can be introduced via line 214 into line 210. In one or more embodiments, a minimum of 25% wt, 50% wt, 75% wt, 85% wt, 90% wt, 95% wt, or 99% wt of the cooling media 132 introduced to the reservoir 206 can be recycled via line 210.

[0033] Furthermore, although not shown in Figure 2, at least a portion of the cooling media 132 recycled via line 210 can pass through one or more treatment and/or purification systems, such as a fines separation unit, to remove one or more contaminants including, but not limited to, accumulated solids, hydrocarbons, metals, dissolved salts, mixtures thereof, derivatives thereof, or any combination thereof.

[0034] In one or more embodiments, the temperature of at least a portion of the cooling media 132 recycled via line 210 can be adjusted using one or more heat transfer units 212. Exemplary heat transfer units 212 can include any system, device, or combination of

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systems and/or devices suitable for adjusting the temperature of the cooling media 132 in line 210 to provide recycled cooling media 132 in a predetermined temperature range. The one or more heat transfer units 212 can include one or more U-tube exchangers, shell-and-tube exchangers, plate and frame exchangers, spiral wound exchangers, fin-fan exchangers, evaporative coolers, or any combination thereof. The operating temperature of the one or more heat transfer units 212 can range from about 0°C to about 90°C, from about 20°C to about 75°C, or from about 30°C to about 60°C. The operating pressure of the one or more heat transfer units 212 can range from about 101 kPa to about 2,160 kPa, from about 300 kPa to about 1,820 kPa, or from about 500 kPa to about 1,475 kPa.

[0035] The recycled cooling media 132 can be introduced to at least one fluid distributor 216 disposed in the cooling channel 130. Each fluid distributor 216 can be a weir, nozzle, or other device capable of delivering the required flow of cooling media 132 to the cooling channel 130. In an embodiment, the flowrate of the cooling media 132 can be regulated by adjusting the fluid distributor, thereby providing a desired residence time for the solid asphaltenic pellet 134 to be in contact with the cooling media 132. Furthermore, each fluid distributor 216 can also serve as a nozzle configured to propel the quenched asphaltenic pellets 134 towards the separator 202.

[0036] Figure 3 depicts an illustrative system for pelletizing heavy hydrocarbons, according to another embodiment of the present disclosure. The drop former 102, conveyor belt 124, and cooling channel 130 can operate in a manner substantially similar to the descriptions provided above, and therefore will not be described in detail. At least one modification can include the angular disposition of the conveyor belt 124. As illustrated, the conveyor belt 124 can be angled or disposed such that one end 302 is at least partially immersed in the flow of the cooling media 132. Submerging a portion of the conveyor belt 124 can allow for a portion of heat transfer to occur between the surface of the belt 124 and the cooling media 132, thereby maintaining the conveyor belt 124 at a reduced temperature.

[0037] In operation, the molten asphaltene can be extruded from the drop former 102 onto the conveyor belt 124, as described above. The extruded droplets 122, however, can be transported directly into the cooling media 132. Upon contacting the cooling media 132, the droplets 122 can rapidly quench into asphaltenic pellets 134 and be swept into the current of the cooling media 132. Separation of the asphaltenic pellets 134 from the cooling media

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132, and recycling of the cooling media 132 can also be implemented, as described above with reference to Figure 2.

[0038] Figure 4 depicts an illustrative system for pelletizing heavy hydrocarbons, according to another embodiment of the present disclosure. The drop former 102 and cooling channel 130 can operate in a manner substantially similar to the descriptions provided above, and therefore will not be described in detail. At least one modification can include the elimination of the conveyor belt 124 beneath the drop former 102. As can be appreciated, eliminating the conveyor belt 124 can save on machinery costs and overall operating expenses of the system 100.

[0039] In operation, the droplets 122 can be extruded from the drop former 102 and plunge directly into a cooling channel 130 disposed below. Similar to the embodiments disclosed above, the droplets 122 can be quenched and solidified into asphaltenic pellets 134 by the cooling media 132 located within the cooling channel 130. In at least one embodiment, the asphaltenic pellets 134 can be swept down the cooling channel 130 by a current caused by the flowing cooling media 132. Separation of the asphaltenic pellets 134 from the cooling media 132, and recycling of the cooling media 132 can also be implemented as described above.

[0040] Although not specifically illustrated, also contemplated in the present disclosure is the implementation of several equivalent pelletization systems 100, disposed in series or otherwise adjacent to each other, and using the same conveyor belt 124 or cooling channel 130 for creating asphaltenic pellets 134. In at least one embodiment, one system 100 can directly face another system 100 and be configured to continuously feed droplets 122 disposed on the respective conveyor belts 124 into a common cooling channel 130 or another conveying system (not shown) altogether. Because of the small size of the system 100, especially the overall length of the conveyor belt 124, when compared with other drop forming applications, a significant savings in initial capital investment and operating expenses can be achieved. Moreover, the small size of the system 100 frees up valuable plot size on the floor of an industrial facility; portions of which could be resourcefully used otherwise.

[0041] Certain embodiments and features have been described using a set of numerical upper limits and a set of numerical lower limits. It should be appreciated that ranges from any lower limit to any upper limit are contemplated unless otherwise indicated. Certain

lower limits, upper limits and ranges appear in one or more claims below. All numerical values are "about" or "approximately" the indicated value, and take into account experimental error and variations that would be expected by a person having ordinary skill in the art.

[0042] Various terms have been defined above. To the extent a term used in a claim is not defined above, it should be given the broadest definition persons in the pertinent art have given that term as reflected in at least one printed publication or issued patent. Furthermore, all patents, test procedures, and other documents cited in this application are fully incorporated by reference to the extent such disclosure is not inconsistent with this application and for all jurisdictions in which such incorporation is permitted.

[0043] While the foregoing is directed to embodiments of the present invention, other and further embodiments of the invention may be devised without departing from the basic scope thereof, and the scope thereof is determined by the claims that follow.

Claims:

What is claimed is:

1. A method of pelletizing hot asphaltenes, comprising:
extruding an asphaltenic hydrocarbon from a drop former to form droplets;
depositing the asphaltenic hydrocarbon droplets on a conveyor adjacent to the drop former;
quenching the asphaltenic hydrocarbon droplets from the conveyor in a cooling media disposed in a cooling channel, thereby solidifying at least a portion of the asphaltenic hydrocarbon droplets by transferring heat from the asphaltenic hydrocarbon droplets to the cooling media to generate asphaltenic pellets; and
separating the asphaltenic pellets from the cooling media.
2. The method of claim 1, wherein the asphaltenic hydrocarbon comprises one or more hydrocarbon mixtures having one or more aromatic compounds, one or more naphthenic compounds, or a mixture of both.
3. The method of claim 1, wherein the asphaltenic hydrocarbon comprises one or more compounds insoluble in light, paraffinic, solvents and soluble in aromatic compounds.
4. The method of claim 1, wherein the cooling media continuously flows in the cooling channel, thereby coursing the asphaltenic pellets towards a conveyor system configured to separate the asphaltenic pellets from the cooling media.
5. The method of claim 1, wherein the cooling media has a temperature of from about 0°C to about 95°C.
6. The method of claim 1, wherein the cooling media in the cooling channel has a depth of from about 0.25 to about 2 inches.
7. The method of claim 1, further comprising recycling at least a portion of the cooling media back into the cooling channel.

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8. A method of pelletizing hot asphaltenes, comprising:
extruding an asphaltenic hydrocarbon from a drop former to form droplets;
depositing the droplets into a cooling channel having a cooling media flowing therein, wherein the cooling channel is disposed at a decline with respect to horizontal;
quenching the droplets in the cooling media by transferring heat from the droplets to the cooling media to form solid asphaltenic pellets; and
removing the solid asphaltenic pellets from the cooling media.
9. The method of claim 8, wherein the asphaltenic hydrocarbon comprises a hydrocarbon mixture having one or more aromatic compounds, one or more naphthenic compounds, or a mixture of both.
10. The method of claim 8, wherein the cooling media flows in the cooling channel, thereby causing the asphaltenic pellets to course towards a conveyor system configured to separate the asphaltenic pellets from the cooling media.
11. The method of claim 8, wherein the cooling media has a temperature of from about 0°C to about 95°C.
12. The method of claim 8, further comprising recycling at least a portion of the cooling media back into the cooling channel.
13. The method of claim 8, wherein the cooling media comprises water, brine, C₅ to C₉ alkane hydrocarbons, or a mixture thereof.
14. A system for the pelletization of a heavy hydrocarbon, comprising:
a drop former having a stator disposed within a rotary outer drum, wherein the rotary outer drum rotates concentrically about the stator and defines a plurality of perforations configured to coincide cyclically with a channel mounted in the stator, the stator being configured to receive and extrude a molten heavy hydrocarbon out of the channel and through the outer drum to form droplets;
a conveyor disposed adjacent to and below the drop former and configured to receive the droplets from the drop former;
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a cooling channel having a cooling media flowing therein and configured to receive the droplets from the conveyor, wherein the cooling media quenches the droplets into solidified pellets and causes the pellets to course through the cooling channel; and

a conveyor system configured to receive and separate the pellets from the cooling media.

15. The system for claim 14, wherein the heavy hydrocarbon is an asphaltene.
16. The system for claim 14, wherein the conveyor is disposed at a decline.
17. The system for claim 16, wherein a first end of the conveyor is adjacent the drop former to receive the droplets and a second end of the conveyor is at least partially immersed in the cooling media of the cooling channel.
18. The system for claim 14, wherein the conveyor system comprises a screen configured to separate at least a portion of the cooling media from the pellets, thereby allowing the cooling media to accumulate in a reservoir.
19. The system for claim 18, wherein at least a portion of the cooling media in the reservoir is recycled back through the cooling channel.
20. The system for claim 19, wherein the cooling media recycled to the cooling channel is further passed through at least one heat transfer unit configured to reduce the temperature of the cooling media.

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Reivindicaciones:

Lo que se reivindica es:

1. Un método para formar pellas de asfaltenos calientes, que comprende:
extruir un hidrocarburo asfalténico con un gotero para formar gotitas;
depositar las gotitas de hidrocarburos asfalténicos sobre un transportador adyacente al gotero;
enfriar las gotitas de hidrocarburos asfalténicos del transportador en un medio refrigerante dispuesto en un canal refrigerante para que se solidifique al menos una parte de las gotitas de hidrocarburos asfalténicos mediante la transferencia de calor de las gotitas de hidrocarburos asfalténicos al medio refrigerante para generar pellas asfalténicas; y
separar las pellas asfalténicas del medio refrigerante.
2. El método de la reivindicación 1 en el cual el hidrocarburo asfalténico comprende una o más mezclas de hidrocarburos que tienen uno o más compuestos aromáticos, uno o más compuestos nafténicos, o una mezcla de ambos.
3. El método de la reivindicación 1 en el cual el hidrocarburo asfalténico comprende uno o más compuestos insolubles en solventes parafínicos livianos, y solubles en compuestos aromáticos.
4. El método de la reivindicación 1 en el cual el medio refrigerante fluye constantemente dentro del canal refrigerante dirigiendo así las pellas asfalténicas hacia el sistema transportador configurado para separar las pellas asfalténicas del medio refrigerante.

5. El método de la reivindicación 1 en el cual el medio refrigerante tiene una temperatura de cerca de 0°C hasta unos 95°C.
6. El método de la reivindicación 1 en el cual el medio refrigerante dentro del canal refrigerante tiene una profundidad entre cerca de 0,25 a cerca de 2 pulgadas.
7. El método de la reivindicación 1 que además comprende reciclar al menos una parte del medio refrigerante de vuelta al canal refrigerante.
8. Un método para formar pellas de asfaltenos calientes, que comprende:
 - extruir un hidrocarburo asfálténico con un gotero para formar gotitas;
 - depositar las gotitas en un canal refrigerante que contiene un medio refrigerante que circula en su interior, y en el cual el canal refrigerante tiene una inclinación con respecto a la horizontal;
 - enfriar las gotitas en el medio refrigerante transfiriendo calor de las gotitas al medio refrigerante para generar pellas asfálténicas sólidas; y
 - retirar las pellas asfálténicas del medio refrigerante.
9. El método de la reivindicación 8 en el cual el hidrocarburo asfálténico comprende una mezcla de hidrocarburos que tienen uno o más compuestos aromáticos, uno o más compuestos nafténicos, o una mezcla de ambos.
10. El método de la reivindicación 8 en el cual el medio refrigerante fluye dentro del canal refrigerante, causando que las pellas asfálténicas se dirijan hacia un sistema transportador configurado para separar las pellas asfálténicas del medio refrigerante.

11. El método de la reivindicación 8 en el cual el medio refrigerante tiene una temperatura de cerca de 0°C a unos 95°C.

12. El método de la reivindicación 8 que además comprende reciclar al menos parte del medio refrigerante de vuelta al canal refrigerante.

13. El método de la reivindicación 8 en el cual el medio refrigerante comprende agua, salmuera, hidrocarburos alkanos de C₅ a C₉, o una mezcla de los mismos.

14. Un sistema para formar pellas de hidrocarburos pesados que comprende:

un gotero que tiene un estator dispuesto dentro de un tambor rotatorio externo, siendo que el tambor rotatorio externo gira concéntricamente alrededor del estator y define una pluralidad de perforaciones configuradas para coincidir cíclicamente con un canal montado en el estator, estando el estator configurado para recibir y extruir un hidrocarburo pesado derretido del canal y a través del tambor externo, para formar gotitas;

un transportador dispuesto de manera adyacente y por debajo del gotero y configurado para recibir las gotitas del gotero;

un canal refrigerante que contiene un medio refrigerante que fluye en su interior, configurado para recibir las gotitas provenientes del transportador, en el cual el medio refrigerante enfría las gotitas para formar pellas sólidas y hace que las pellas sigan su curso a través del canal refrigerante; y

un sistema transportador configurado para recibir y separar las pellas del medio refrigerante.

15. El sistema de la reivindicación 14 en el cual el hidrocarburo pesado es un asfalteno.

16. El sistema de la reivindicación 14 en el cual el transportador está dispuesto en un ángulo.

17. El sistema de la reivindicación 16 en el cual un primer extremo del transportador está adyacente al gotero para recibir las gotitas y un segundo extremo del transportador está, al menos parcialmente, inmerso en el medio refrigerante del canal refrigerante.

18. El sistema de la reivindicación 14 en el cual el sistema transportador comprende una malla configurada para separar al menos una parte del medio refrigerante de las pellas, permitiendo así que el medio refrigerante se acumule en un depósito o recipiente.

19. El sistema de la reivindicación 18 en el cual al menos una parte del medio refrigerante contenido en el depósito se recicla de vuelta al canal refrigerante.

20. El sistema de la reivindicación 19 en el cual el medio refrigerante reciclado al canal refrigerante se pasa además a través de al menos una unidad de transferencia de calor configurada para reducir la temperatura del medio refrigerante.

ABSTRACT

Systems and methods for pelletizing a molten heavy hydrocarbon that can be extruded from a drop former to create a plurality of droplets that are subsequently quenched in a cooling media to create asphaltenic pellets. The asphaltenic pellets can be solidified by transferring heat from the droplets to the cooling media to provide the solid asphaltenic pellets. The solid asphaltenic pellets can then be separated from the cooling media which can be recycled for use.

DECLARATION AND POWER OF ATTORNEY
(ORIGINAL APPLICATION)

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and/or inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Systems and Methods of Pelletizing Heavy Hydrocarbons

the specification of which: (check one)

☒ is attached hereto.

☐ was filed on _____ as Serial No. _____.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application(s) of which priority is claimed.

Prior Foreign Application(s):

<u>Claimed</u>			<u>Priority</u>	
_____	_____	_____	☐	☐
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)

(Filing Date)

(Status)

POWER OF ATTORNEY

As a named inventor, I hereby appoint the attorney(s) and/or agent(s) associated with CUSTOMER NO. 32583 to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

SEND CORRESPONDENCE TO: CUSTOMER NO. 32583.

DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SIGNATURE(S)

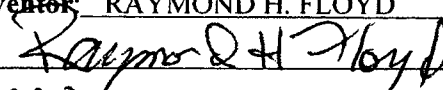
Full name of **first inventor**: ANAND SUBRAMANIAN

Inventor's signature: 

Date: 20 Jan 2010

Country of Citizenship: U.S.A. Address: 6, Canaveral Creek Lane, Sugar Land Texas 77479, U.S.A.

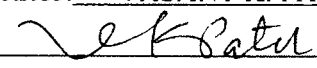
Full name of **second inventor**: RAYMOND H. FLOYD

Inventor's signature: 

Date: 20 January 2010

Country of Citizenship: U.S.A. Address: 2210 Lytham Lane, Katy, Texas 77450, U.S.A.

Full name of **third inventor**: VASANT K. PATEL

Inventor's signature: 

Date: 20-JAN-2010

Country of Citizenship: U.S.A. Address: 4102 Tremont Court, Sugar Land, Texas 77479, U.S.A.

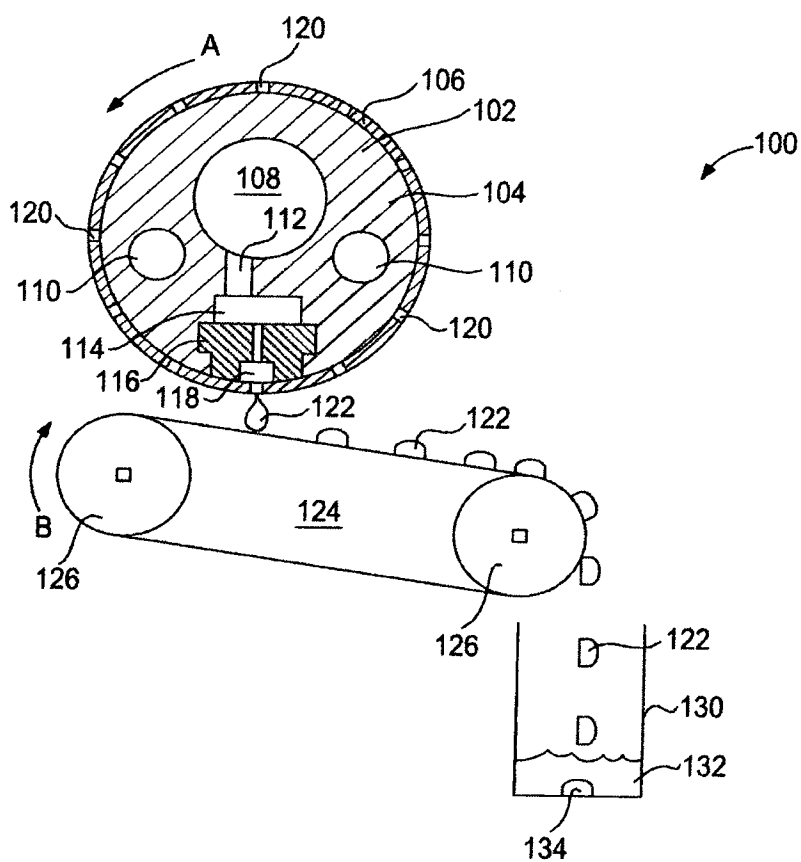


FIG. 1

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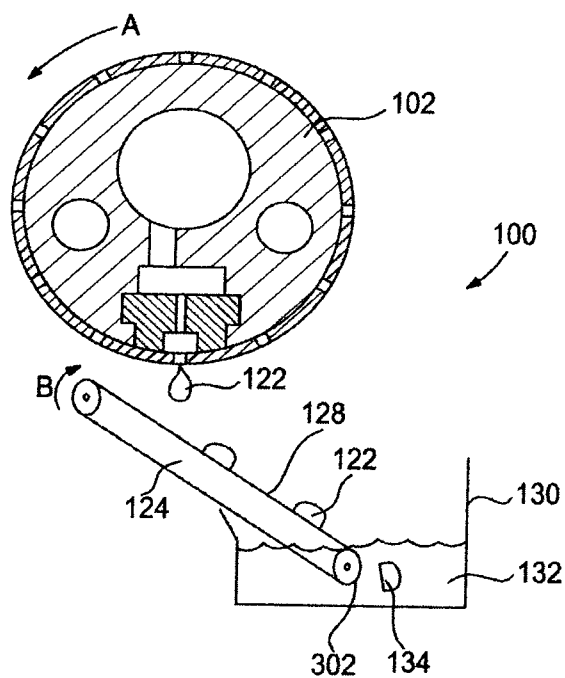


FIG. 3

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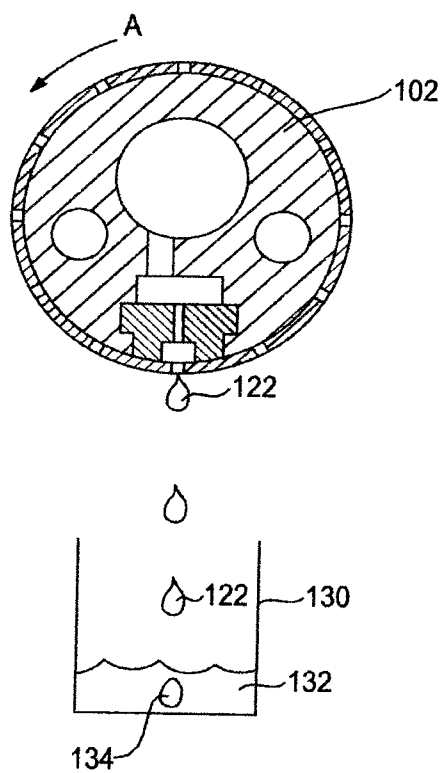


FIG. 4

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	09-10	
		Application Number		
Title of Invention	Systems and Methods of Pelletizing Heavy Hydrocarbons			
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.				

Secrecy Order 37 CFR 5.2

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Applicant Information:

Applicant 1					Remove
Applicant Authority ☒ Inventor		☐ Legal Representative under 35 U.S.C. 117		☐ Party of Interest under 35 U.S.C. 118	
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Anand		Subramanian		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Sugar Land	State/Province	TX	Country of Residence i	US
Citizenship under 37 CFR 1.41(b) i		US			
Mailing Address of Applicant:					
Address 1		6 Canaveral Creek Lane			
Address 2					
City	Sugar Land	State/Province	TX		
Postal Code	77479	Countryi	US		
Applicant 2					Remove
Applicant Authority ☒ Inventor		☐ Legal Representative under 35 U.S.C. 117		☐ Party of Interest under 35 U.S.C. 118	
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Raymond	H.	Floyd		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Katy	State/Province	TX	Country of Residence i	US
Citizenship under 37 CFR 1.41(b) i		US			
Mailing Address of Applicant:					
Address 1		2210 Lytham Lane			
Address 2					
City	Katy	State/Province	TX		
Postal Code	77450	Countryi	US		
Applicant 3					Remove
Applicant Authority ☒ Inventor		☐ Legal Representative under 35 U.S.C. 117		☐ Party of Interest under 35 U.S.C. 118	
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Vasant	K.	Patel		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Sugar Land	State/Province	TX	Country of Residence i	US

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	09-10
		Application Number	
Title of Invention	Systems and Methods of Pelletizing Heavy Hydrocarbons		

Citizenship under 37 CFR 1.41(b) i		US	
Mailing Address of Applicant:			
Address 1	4102 Tremont Court		
Address 2			
City	Sugar Land	State/Province	TX
Postal Code	77479	Country	US
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.			Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence information of this application.			
Customer Number	32583		
Email Address	Christian.Heausler@kbr.com	Add Email	Remove Email

Application Information:

Title of the Invention	Systems and Methods of Pelletizing Heavy Hydrocarbons		
Attorney Docket Number	09-10	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		Sub Class (if any)	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	4	Suggested Figure for Publication (if any)	1

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐ Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.			
Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	09-10
		Application Number	
Title of Invention	Systems and Methods of Pelletizing Heavy Hydrocarbons		
Customer Number	32583		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

Prior Application Status		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button. Add			

Foreign Priority Information:

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

		Remove	
Application Number	Country ⁱ	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			☒ Yes ☐ No
Additional Foreign Priority Data may be generated within this form by selecting the Add button. Add			

Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

Assignee 1 Remove			
If the Assignee is an Organization check here. ☒			
Organization Name	KELLOGG BROWN & ROOT LLC		
Mailing Address Information:			
Address 1	601 Jefferson Avenue		
Address 2			
City	Houston	State/Province	TX
Country ⁱ	US	Postal Code	77002
Phone Number	713-753-8661	Fax Number	713-753-7626
Email Address	christian.heausler@kbr.com		
Additional Assignee Data may be generated within this form by selecting the Add button. Add			

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number		09-10							
		Application Number									
Title of Invention		Systems and Methods of Pelletizing Heavy Hydrocarbons									
Signature		/Christian Heausler/		Date (YYYY-MM-DD)		2010-02-03					
First Name		Christian		Last Name		Heausler		Registration Number		50771	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

2020
Bogotá D.C.,

Doctor(a)
RODRIGUEZ D' ALEMAN DILIA MARIA
Apoderado(a) y/o Representante de
KELLOGG BROWN & ROOT LLC.

REFERENCIA	Radicación No. 11 11871
	Trámite 2
	Evento 1
	Actuación 416
	Oficio No. 13899
	Folios 1

Teniendo en cuenta que la solicitud de privilegio de patente que se tramita bajo el expediente indicado en la referencia, reúne los requisitos de forma establecidos en los artículos 26 y 27 de la Decisión 486 de la Comisión de la Comunidad Andina, y en las demás disposiciones vigentes sobre la materia, se envía el extracto de la solicitud a la Oficina de Comunicaciones para efecto de su publicación en la Gaceta de Propiedad Industrial.

De acuerdo con lo previsto por el artículo 40 de la Decisión 486/00, la publicación en este caso se hará a partir del día 02 del mes de Agosto de 2012.

Cúmplase
Dado en Bogotá DC,

20 OCT. 2011


JOSE LUIS SALAZAR LOPEZ
Director de Nuevas Creaciones (c)

jesanchl